



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

	SUMMER-2023		
	Exam Seat No.:		
	Academic Year: 2022-2023	Semester: II	
	Name of Programme : F.Y.B.Tech	Pattern: 2022	
	Name of Course: Applied Mathematics - II	Course Code: FYE221002	
	Max. Marks:60	Duration:2.30hrs	

1 This question paper contains 3 pages.

1. Answer to each new question is to be started on a new page.
2. Assume suitable data wherever required, but justify it.
3. Use of non-programmable pocket calculator is allowed.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

Que. No.1

Solve $\frac{dy}{dx} + \frac{1}{1+x^2}y = \frac{e^{\tan^{-1}x}}{1+x^2}$ (6) CO2

Que. No.2

A Circuit consists of resistance R ohms and a Condenser of 'C' Farads connected to a constant e.m.f. If $\frac{q}{c}$ is the voltage of condenser at time t after closing the circuit, show that the voltage at time t is
 $E (1 - e^{-\frac{t}{RC}})$ (6) CO3

Que. No.3

Find value of y for x = 0.5 for the following table of x, y values using Newton's forward difference formula.

a)

x	0	1	2	3	4
y	1	5	25	100	250

(5) CO3

OR

Find value of y for x = 4.5 for the following table of x, y values using Newton's Backward difference formula.

b)

x	1	2	3	4	5
y	14	30	62	116	198

(5) CO3

1. Prove that $\Delta \nabla = \nabla \Delta = \delta^2$

c)

2. Evaluate $\Delta(6x^2 + 4x + 4)$, $h = \frac{1}{2}$

(5) CO3

OR

1. Prove that $(1 + \Delta)(1 - \nabla) = 1$

d)

2. Evaluate $(\Delta - \nabla)x^2$, $h = 1$

(5) CO3

Find Lagrange's interpolating polynomial passing through set of points

e)

x	0	1	2
y	4	3	6

(6) CO3

Use it to find y at x=1.5, find $\frac{dy}{dx}$ at x=0.5

OR

Use Stirling's formula to find f(25) from the following data

f)

x	10	20	30	40
f(x)	1.1	2	4.4	7.9

(6) CO3

Que. No.4

a)

Use Euler's method to solve the equation, subject to the condition $y(0) = 0$, $h = 0.2$, $\frac{dy}{dx} = x + y$, Find y at x= 0.8

(5) CO3

OR

b)

Solve the equation $\frac{dy}{dx} = 1 + xy$, $y(0) = 1$, $h = 0.1$ to find y at x = 0.1 using modified Euler's method taking h = 0.1

(5) CO3

c)

Using 4th order R-K Method find y when x=0.2, given that $\frac{dy}{dx} = \frac{1}{x+y}$, with $y(0)=1$, take h=0.2

(6) CO3

OR

Numerical solution of the differential equation $\frac{dy}{dx} = 2 + xy$,
is tabulated as

d)

x	1.0	1.2	1.4	1.6
y	1.0	1.6	2.2771	3.0342

(6) CO3

Find y at x = 1.8 by Milne's predictor-corrector method taking
h = 0.2

- e) Using Simpson's $(\frac{1}{3})^{th}$ rule, evaluate $\int_4^{5.2} \log_e x \, dx$
taking h = 0.2. (5) CO5

OR

- f) Use Simpsons $(\frac{3}{8})^{th}$ rule to evaluate $\int_0^1 [\frac{1}{1+x^2}] dx$ by taking $h=\frac{1}{6}$ (5) CO5

Que. No.5

- a) Evaluate $\iint_R \frac{xy \, dx \, dy}{\sqrt{1-y^2}}$ over the positive quadrant of the
Circle $x^2 + y^2 = 1$. (5) CO2

OR

- b) Evaluate by change of order $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} \, dx \, dy$ (5) CO2

- c) Evaluate $\int_0^a \int_{y=x}^{\sqrt{a^2-x^2}} \frac{x \, dx \, dy}{\sqrt{x^2+y^2}}$ (5) CO2

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OR

- d) Find the area outside the circle $x^2 + y^2 = a^2$ and inside the
cardioid $r = a(1+\cos\theta)$ (5) CO2

- e) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dz \, dx \, dy$ (6) CO5

OR

- f) Find the volume of the cylinder $x^2 + y^2 = 2ax$ intercepted
between the paraboloid $x^2 + y^2 = 2az$ & the XY plane (6) CO5